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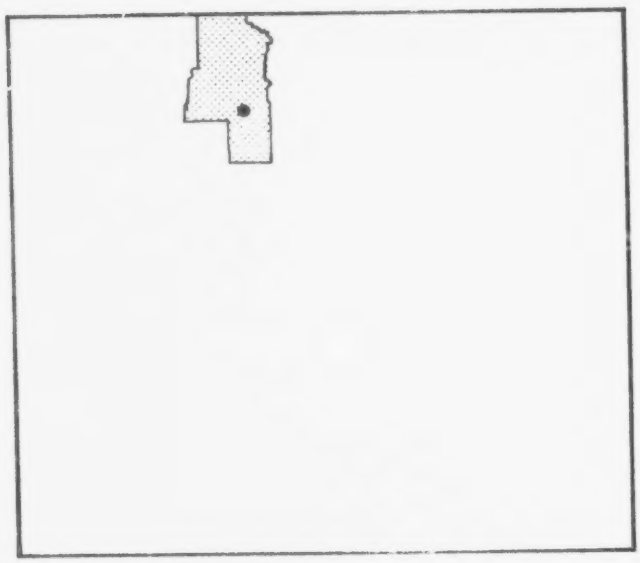
FLOOD INSURANCE STUDY

TOWN OF
OAK CREEK, COLORADO
ROUTT COUNTY



JULY 17,1989

Federal Emergency Management Agency

COMMUNITY NUMBER - 080158

NOTICE TO
FLOOD INSURANCE STUDY USERS

Communities participating in the National Flood Insurance Program have established repositories of flood hazard data for floodplain management and flood insurance purposes. This Flood Insurance Study may not contain all data available within the repository. It is advisable to contact the community repository for any additional data.

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FLOOD INSURANCE STUDY
TOWN OF OAK CREEK, ROUTT COUNTY, COLORADO

1.0 INTRODUCTION

1.1 Purpose of Study

This Flood Insurance Study investigates the existence and severity of flood hazards in the Town of Oak Creek, Routt County, Colorado, and aids in the administration of the National Flood Insurance Act of 1968 and the Flood Disaster Protection Act of 1973. This Flood Insurance Study will be used to establish actuarial flood insurance rates and assist the community in their efforts to promote sound floodplain management. Minimum floodplain management requirements for participation in the National Flood Insurance Program (NFIP) are set forth in the Code of Federal Regulations at 44 CFR, 60.3.

This Flood Insurance Study was prepared by compiling pertinent information for the flood hazard areas in the Town of Oak Creek, Colorado, from existing technical and/or scientific data originally prepared by others for purposes other than the NFIP. These existing data were reviewed by the Federal Emergency Management Agency (FEMA) prior to its use in the development of this Flood Insurance Study to ensure compliance with NFIP regulations.

In some states or communities, floodplain management criteria or regulations may exist that are more restrictive or comprehensive than those on which these Federally-supported studies are based. In such cases, the more restrictive criteria take precedence and the State (or other jurisdictional agency) will be able to explain them.

1.2 Authority and Acknowledgments

The sources of authority for this Flood Insurance Study are the National Flood Insurance Act of 1968 and the Flood Disaster Protection Act of 1973.

The hydrologic and hydraulic analyses for this Flood Insurance Study were performed by the Colorado Water Conservation Board, Denver, Colorado, in September 1986.

1.3 Coordination

On August 24, 1988, the results of this Flood Insurance Study were reviewed and accepted at a final coordination meeting attended by representatives of the community and FEMA.

2.0 AREA STUDIED

2.1 Scope of Study

This Flood Insurance Study covers the incorporated area of the Town of Oak Creek, Colorado. The area of study is shown on the Vicinity Map (Figure 1).

The area studied by detailed methods was selected based upon the extent and validity of available existing hydrologic and hydraulic data.

Oak Creek was studied by detailed methods from a point approximately 200 feet upstream of Routt County Road 27 to a point approximately 1,900 feet upstream of Oak-Williams Street, a reach of approximately 0.9 mile.

2.2 Community Description

The Town of Oak Creek is located in the northwestern portion of Colorado. Situated in Routt County, Oak Creek is located approximately 17 miles southwest of Steamboat Springs, Colorado. According to 1980 census data, Oak Creek has a population of 929 and in 1970 had a population of 492 (Reference 1). This is a 47 percent increase over a ten-year period. The coldest month and warmest month of the year are January and July, respectively. The mean January temperature is 5°F and the mean July temperature is 75°F. The mean annual precipitation is 19 inches, and the average annual snowfall is 100 inches. The topography consists mainly of valleys and lakes surrounded by forested lands and mountains. The residents in the Town of Oak Creek are employed primarily in the coal mining industry.

2.3 Principal Flood Problems

It is known that significant flooding occurred in 1914, 1939, 1950, and 1984, as well as other years (Reference 2). The streamflow occurring during the May 1984 snowmelt flood was estimated by Dismuke and Dismuke Consultants, Inc., at approximately 650 cubic feet per second (cfs) at County Route 27 (at the northern end of town). Local residents have indicated that the May 1984 flood was the "flood of record." Streamflows for the other flood events are not known. The recurrence interval for the 1984 flood is approximately a 41-year flood event.

"Typical" flooding along Oak Creek is caused by snowmelt runoff. However, at frequencies as rare as the 100-year event, flooding can occur from rainfall runoff. A significant degree of overtopping would occur at each of the five road crossings during a 100-year flood event. Culvert capacities are insufficient to pass the 100-year flow in each case. Only minor blockage of the culverts was assumed at each creek crossing. Insufficient culvert capacity at the County Road 27 crossing would cause water

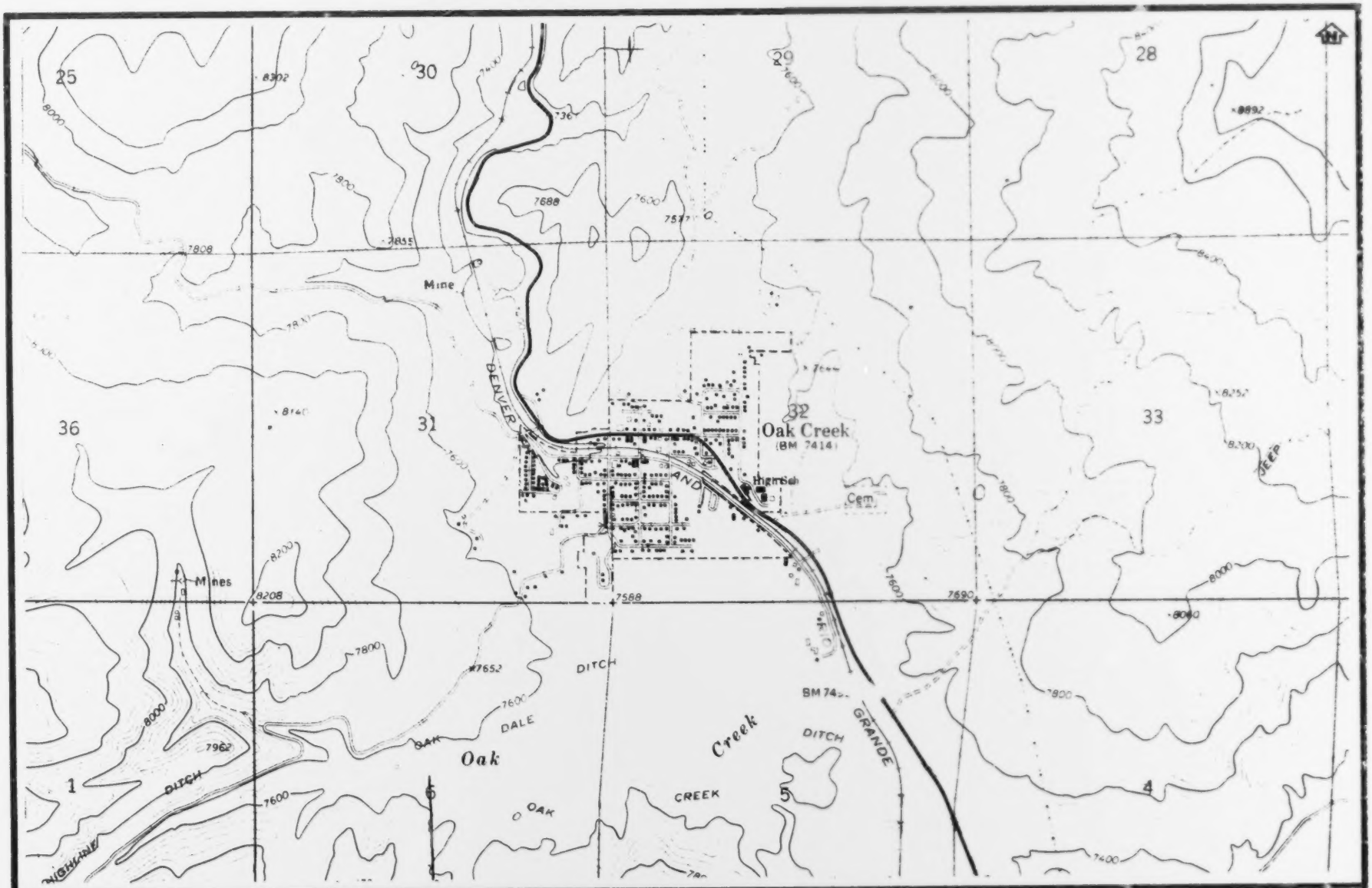


FIGURE 1

FEDERAL EMERGENCY MANAGEMENT AGENCY

TOWN OF OAK CREEK, CO
(ROUTT COUNTY)

APPROXIMATE SCALE

2000 0 2000 4000 8000 FEET

VICINITY MAP

to back up south of the D&RG railroad tracks nearly to the Bell Avenue bridge crossing of Oak Creek. Several low-lying residences would be flooded due to this backwater effect. Insufficient capacity of the crossings of Bell and Sharp Avenues, in conjunction with adjacent low-lying ground to the north of the creek, would cause flooding to some of the buildings in the downtown area. The baseball field area to the east of Moffat Avenue would be flooded due to insufficient capacity of the Moffat Avenue crossing.

Oak Creek headwaters are located at the approximate elevation of 10,240 feet above mean sea level. The highest point in the basin is Sand Point, at 11,182 feet. Oak Creek, at the northern Town of Oak Creek boundary is at 7,390 feet. The length of Oak Creek from its headwaters to where it intersects Oak Creek's northern corporate limit is approximately 14.4 miles. The creek travels in a northeasterly direction for this entire distance.

The drainage area of Oak Creek is 22.7 square miles. There are no major tributaries to Oak Creek.

The study reach along Oak Creek covers the area within the Town of Oak Creek's corporate limits. The length of the study reach is approximately one mile. Oak Creek formerly meandered widely through the town. Over the years, it has been rerouted and straightened (Reference 2).

2.4 Flood Protection Measures

At the present time, the Town of Oak Creek has no flood protection measures within the corporate limits.

3.0 ENGINEERING METHODS

For the flooding sources studied by detailed methods in the community, standard hydrologic and hydraulic study methods were used to determine the flood hazard data required for this study. Flood events of a magnitude which are expected to be equaled or exceeded once on the average during any 10- and 100-year period (recurrence interval) have been selected as having special significance for floodplain management and for flood insurance rates. These events, commonly termed the 10- and 100-year floods, have a 10 and 1 percent chance, respectively, of being equaled or exceeded during any year. Although the recurrence interval represents the long term average period between floods of a specific magnitude, rare floods could occur at short intervals or even within the same year. The risk of experiencing a rare flood increases when periods greater than one year are considered. For example, the risk of having a flood which equals or exceeds the 100-year flood (1 percent chance of annual exceedence) in any 50-year period is approximately 40 percent (4 in 10), and for any 90-year period, the risk increases to approximately 60 percent (6 in 10). The analyses reported herein reflect flooding potentials based on conditions existing in the community at the time of completion of this Flood

Insurance Study. Maps and flood elevations will be amended periodically to reflect future changes.

3.1 Hydrologic Analyses

Hydrologic analyses were carried out to establish peak discharge-frequency relationships for each flooding source studied by detailed methods affecting the community.

A hydrological analysis of flows in Oak Creek was performed for snowmelt and/or rainfall runoff over the basin. There are no active streamflow gage records on Oak Creek. A gage was formerly existent on Oak Creek for only 5 years (water years 1953 to 1957). It was located 4.5 miles southwest of the Town of Oak Creek. The length of record of this gage was insufficient to be analyzed and provide meaningful results. The U.S. Soil Conservation Service's (SCS) unit hydrograph procedure (Reference 3) was then employed to determine the 100-year peak streamflow. Significant parameters used with this method were a 100-year 24-hour rainfall of 2.8 inches and a SCS curve number of 70.

A 100-year peak flow was computed using the assumed basin parameters and compared with the flow values of other streams in the region (Reference 4). Through this comparison, the 100-year peak flow was adjusted to reflect the runoff characteristics of the basin.

The 10-year flood event was assumed to be the result of a snowmelt event. This value was obtained from a regional analysis of streams which had acceptable gage records and similar characteristics.

Peak discharge-drainage area relationships for Oak Creek are shown in Table 1.

TABLE 1 - SUMMARY OF DISCHARGES

Flooding Source and Location	Drainage Area (Sq. Miles)	Peak Discharge (cfs) 10-Year	50-Year	100-Year	500-Year
Oak Creek					
At the Town of Oak Creek	22.7	300	*	1,050	*

*No Data Available

3.2 Hydraulic Analyses

An analysis of the hydraulic characteristics of flooding from the riverine source studied was carried out to provide an estimate of the elevations of floods of the selected recurrence intervals.

An analysis of the hydraulic characteristics of Oak Creek was performed in order to determine water-surface elevations for the 100-year flood. Bridge elevations and sizes of openings were surveyed and measured in the field on January 21 and 22, 1986. These data were combined with cross section data on Oak Creek taken from a 2-foot contour mapping of the Town of Oak Creek (Reference 5). These cross section data became the input data in the U.S. Army Corps of Engineer HEC-2 step-backwater computer program.

Locations of selected cross sections used in the hydraulic analysis are shown on the Flood Profiles (Exhibit 1) and Flood Insurance Rate Map (FIRM) (Exhibit 2).

Roughness coefficients (Manning's "n" values) were also used as HEC-2 input. Roughness values for Oak Creek varied from 0.035 for the channel to 0.040 for the overbank areas.

Critical depth was the starting water-surface elevation at a location several hundred feet downstream from the study reach.

Flood profiles were drawn showing the computed water-surface elevations for floods of the selected recurrence intervals.

The hydraulic analysis for this Flood Insurance Study is based on unobstructed flow. The flood elevations shown on the profiles are thus considered valid only if hydraulic structures remain unobstructed, operate properly, and do not fail.

All elevations are referenced to the National Geodetic Vertical Datum of 1929. Elevation reference marks used in this Flood Insurance Study are shown on the maps; the descriptions of the marks are presented in Elevation Reference Marks (Exhibit 3).

4.0 FLOODPLAIN MANAGEMENT APPLICATIONS

The NFIP encourages state and local governments to adopt sound floodplain management programs. Therefore, each Flood Insurance Study includes a floodplain boundary map designed to assist communities in developing sound floodplain management measures.

4.1 Floodplain Boundaries

To provide a national standard without regional discrimination, the 1 percent annual chance (100-year) flood has been adopted by FEMA as the base flood for floodplain management purposes. For the stream studied by detailed methods, the 100-year floodplain boundaries have been delineated using the flood elevations determined at each cross section.

Between cross sections, the boundaries were interpolated using U.S. Geological Survey topographic maps at a scale of 1:24,000, with a contour interval of 20 feet (Reference 6).

The 100-year floodplain boundary is shown on the FIRM (Exhibit 2). On this FIRM, the 100-year floodplain boundary corresponds to the boundary of the area of special flood hazards (Zone AE and A). Small areas within the floodplain boundaries may lie above the flood elevations but cannot be shown due to limitations of the map scale and/or lack of detailed topographic data.

For the streams studied by approximate methods, only the 100-year floodplain boundary is shown. Initially, approximate 100-year floodplain boundaries in some portions of the study area were taken from the Flood Hazard Boundary Map (FHBM) (Reference 7), but through correspondence with the Colorado Water Conservation Board these boundaries were modified to account for changes in topography since publication of the FHBM in December 1975. The topographic map published for the modified boundaries was prepared at a scale of 1:2400, with contour intervals of 2 feet (Reference 8) and was used as an aid in establishment of the 100-year approximate floodplain boundaries.

4.2 Floodways

Encroachment on floodplains, such as structures and fill, reduces flood-carrying capacity, increases flood heights and velocities, and increases flood hazards in areas beyond the encroachment. One aspect of floodplain management involves balancing the economic gain from floodplain development with the resulting potential increase in flood hazard. For purposes of the NFIP, a floodway is used as a tool to assist local communities in this aspect of floodplain management. Under this concept, the area of the 100-year floodplain is divided into a floodway and a floodway fringe. The floodway is the channel of a stream, plus any adjacent floodplain areas that must be kept free of encroachment so that the 100-year flood can be carried without any substantial increase in flood height. Minimum federal standards limit such increases to 1.0 foot, provided that hazardous velocities are not produced.

Floodways were not computed for this study.

5.0 INSURANCE APPLICATION

For flood insurance rating purposes, flood insurance zone designations are assigned to a community based on the results of the engineering analyses. These zones are as follows:

Zone AE

Zone AE is the flood insurance rate zone that corresponds to the 100-year floodplains that are determined in the Flood Insurance Study by detailed methods. In most instances, whole-foot base flood elevations (BFEs) derived from the detailed hydraulic analyses are shown at selected intervals within this zone.

Zone X

Zone X is the flood insurance rate zone that corresponds to areas outside the 500-year floodplain, areas within 500-year floodplain, areas of 100-year flooding where average depths are less than 1 foot, areas of 100-year flooding where the contributing drainage area is less than 1 square mile, and areas protected from the 100-year flood by levees. No BFEs or depths are shown within this zone.

6.0 FLOOD INSURANCE RATE MAP

The FIRM is designed for flood insurance and floodplain management applications.

For flood insurance applications, the FIRM designates flood insurance rate zones as described in Section 5.0 and, in the 100-year floodplains that were studied by detailed methods, shows selected whole-foot BFEs or average depths. Insurance agents use the zones and BFEs in conjunction with information on structures and their contents to assign premium rates for flood insurance policies.

For floodplain management applications, the FIRM shows by tints, screens, and symbols, the 100-year floodplain, and the locations of selected cross sections used in the hydraulic analysis.

7.0 OTHER STUDIES

This Flood Insurance Study was prepared by compiling existing hydrologic and hydraulic, technical and scientific data prepared by other organizations originally for purposes other than the NFIP. The data was identified as the best available at the time of compilation of this Flood Insurance Study, and should depict the general conditions of the flooding sources with relative accuracy. FEMA performed a cursory review and accepted the data as valid for purposes of this Flood Insurance Study and the NFIP. However, if better information is known to exist or has been developed since the Flood Insurance Study, the information should be immediately forwarded to the Chief, Natural and Technological Hazards Division, FEMA, Denver Federal Center, Building 710, Box 25267, Denver, Colorado 80225-0267, for consideration for revision of this Flood Insurance Study.

A report entitled "The 1984 Flood, Commemorative Issue, Oak Creek, Colorado" was written by a local citizen of Oak Creek to explain what occurred during the May 1984 snowmelt runoff and dam failure flood. It also details some flood history and contains numerous pictures showing damages caused by the 1984 flood (Reference 2).

The Federal Insurance Administration prepared a FHBM for the Town of Oak Creek in December 1975 (Reference 7). The FHBM was derived using approximate methods. Corporate limits have changed since that time in the southeast end of town.

A FHBM has been published for the community (Reference 7). The differences between the FHBM and this Flood Insurance Study are justified due to the more detailed nature of this Flood Insurance Study.

This Flood Insurance Study either supersedes or is compatible with all previous studies published on streams studied in this Flood Insurance Study and should be considered authoritative for the purposes of the NFIP.

8.0 LOCATION OF DATA

Information concerning the pertinent data used in the preparation of this Flood Insurance Study can be obtained by contacting the Chief, Natural and Technological Hazards Division, FEMA, Denver Federal Center, Building 710, Box 25267, Denver, Colorado 80225-0267.

9.0 BIBLIOGRAPHY AND REFERENCES

1. U.S. Department of Commerce, Bureau of the Census, 1980 Census of Population, Number of Inhabitants, Colorado, October, 1981.

2. Y. M., The 1984 Flood - Commemorative Issue, Oak Creek, Colorado

3. U.S. Soil Conservation Service, Hydrology, SCS National Engineering Handbook, Section 4, 1964 (Revised 1969).

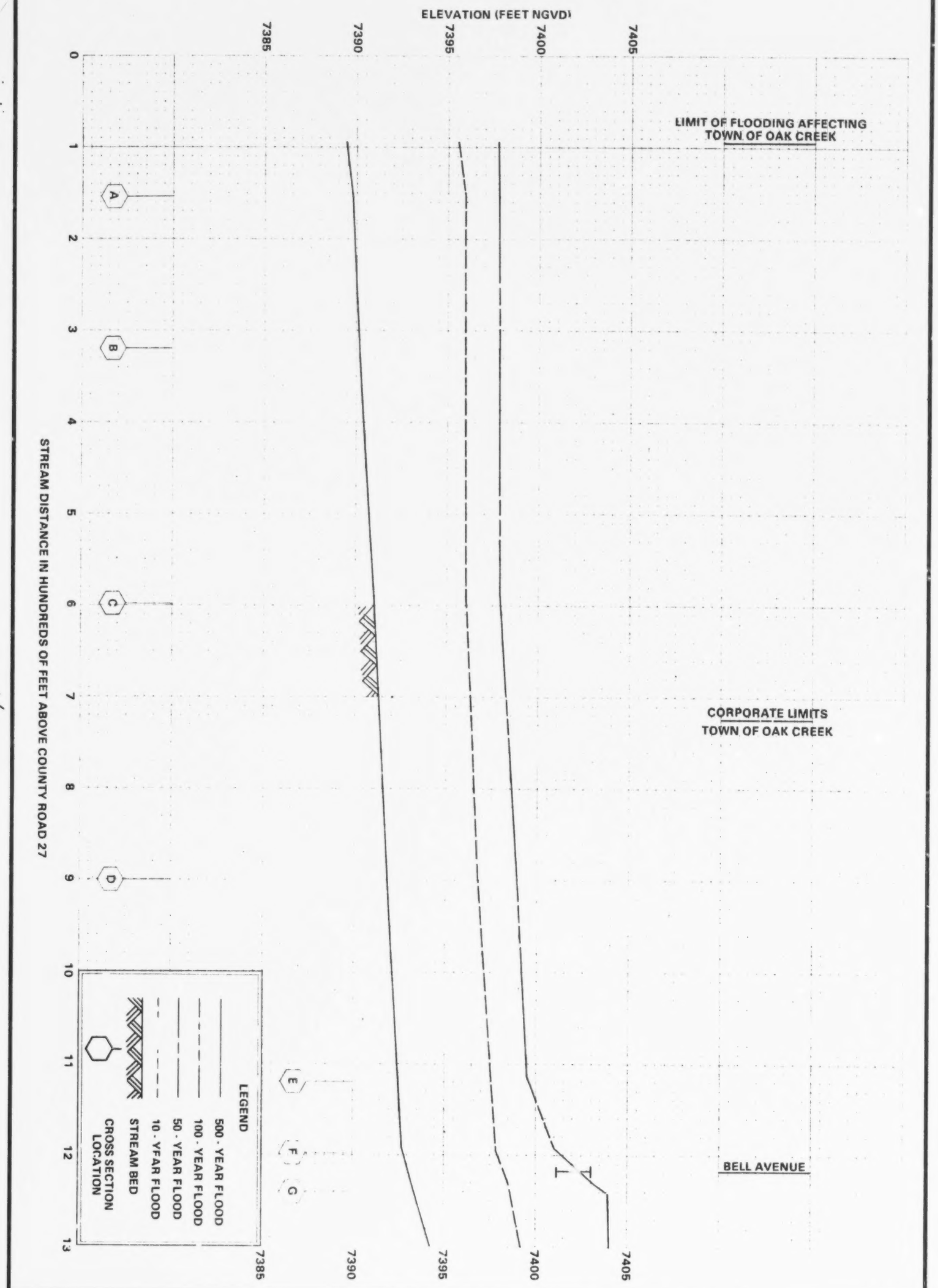
4. Federal Insurance Administration, Flood Insurance Study, Town of Hayden, Colorado, December, 1977.

5. Dismuke and Dismuke Consultants, Inc., 2 foot contour maps prepared from aerial photos of June 2, 1981.

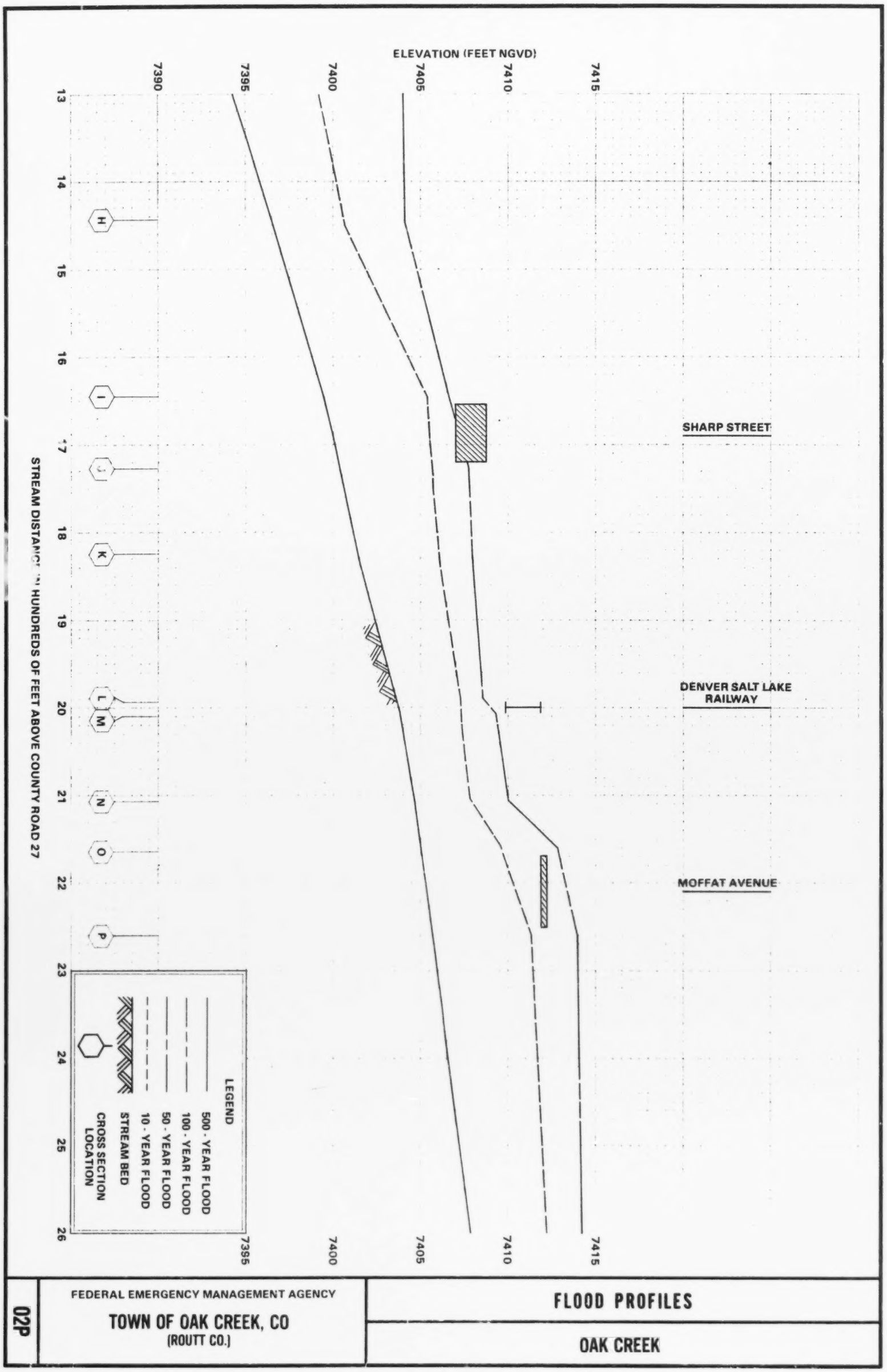
6. U.S. Geological Survey, 7.5-Minute Series Topographic Maps, Scale 1:24,000, Contour Interval 20 feet, Oak Creek, Colorado, 1969.

7. U.S. Department of Housing and Urban Development, Federal Insurance Administration, Flood Hazard Boundary Map, Town of Oak Creek, Routt County, Colorado, December 19, 1975.

8. Reids Aerial, Mapping Aurora, Colorado, Topographic Map for Area of Town of Oak Creek, Colorado, Scale 1:2400, Contour Interval 2 feet, June 2, 1981.



01P	FEDERAL EMERGENCY MANAGEMENT AGENCY TOWN OF OAK CREEK, CO (ROUTT CO.)	FLOOD PROFILES OAK CREEK



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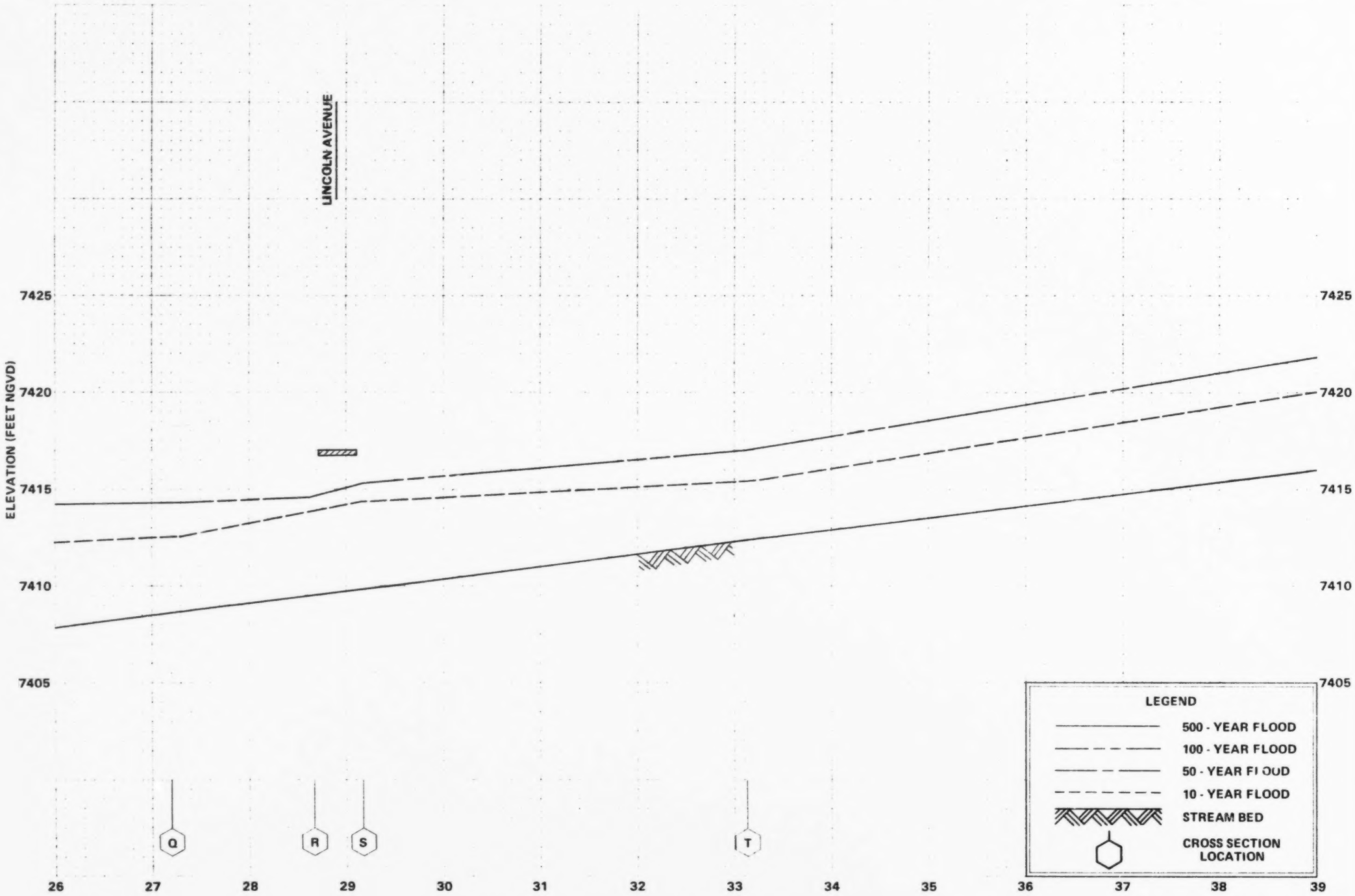


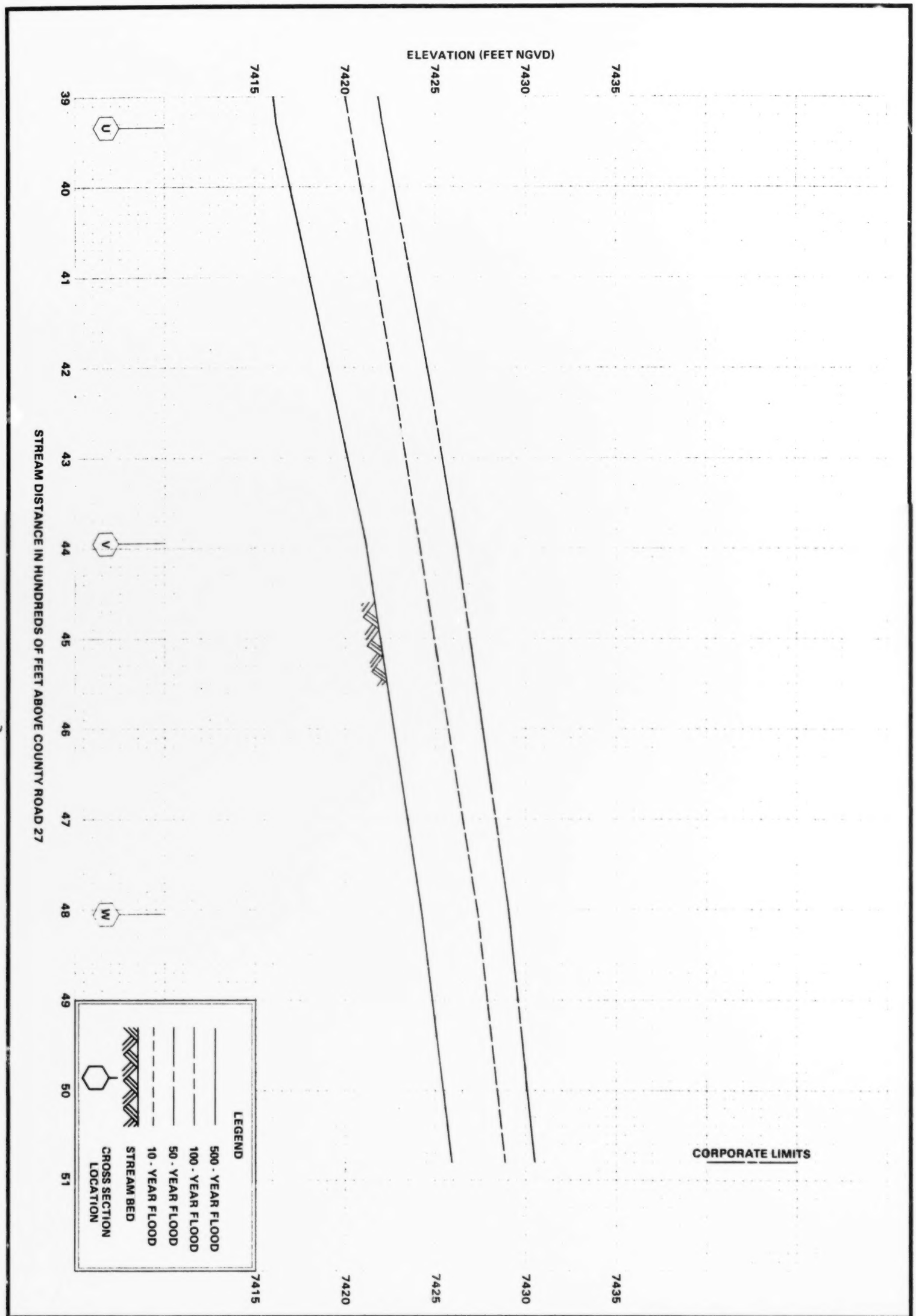
FLOOD PROFILES

OAK CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

TOWN OF OAK CREEK, CO
(ROUTT CO.)

03P



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04P

FEDERAL EMERGENCY MANAGEMENT AGENCY

TOWN OF OAK CREEK, CO
(ROUTT CO.)

FLOOD PROFILES

OAK CREEK